instruments and work of the Weather Bureau to the class in physical geography of the high school in that city on November 4.

Mr. Charles Stewart, Observer, United States Weather Bureau, Spokane, Wash., reports that on March 21 he addressed the pupils of the Spokane High School, on Weather Changes and their Causes. On April 21 and 22 the pupils visited the Weather Bureau station and were instructed in the nature and use of the apparatus and in other matters connected with meteorology.

Mr. J. B. Marbury, Section Director, Atlanta, Ga., writes, as follows:

On November 13 of this year I delivered a lecture to a class at the Boys' High School in this city. My subject was "The Weather and the science of forecasting." My talk was mainly a preface to others that I have promised to give from time to time as my duties will permit. Much interest was shown in my remarks, which the teacher has since informed me made a deep impression upon his class. The increasing interest shown in the Bureau is, I think, largely due to the lectures and talks given from time to time by the various Weather Bureau officials throughout the country.

SAMUEL B. PFANNER.

In the death of Observer Samuel B. Pfanner, which occurred at Toledo, his native city, on November 2, 1902, the Weather Bureau sustains the loss of a faithful and efficient member of its observing force. Mr. Pfanner was born May 31, 1852. He entered the Weather Service September 2, 1890, and performed duty at Chicago, Ill., Cincinnati, Ohio, New Orleans, La., San Antonio, Tex., and Toledo, Ohio. Recently, his health failing him, his transfer to Phoenix, Ariz., was promptly arranged for at his request, but his illness took a sudden change for the worse, and he died before he could execute the official orders for his transfer which he had received.—*D. J. C.*

AUSTRALIAN DROUGHTS AND THE MOON.

Mr. H. C. Russell, Director of the Observatory at Sydney, New South Wales, has published in the Journal and Proceedings of the Royal Society of New South Wales, for the year 1901, a memoir on the relation of the moon's motion in declination and the quantity of rain in that colony, in which the author concludes "that rain is clearly shown to come in abundance when the moon is in certain degrees of her motion south; but when the moon begins to go north then droughty conditions prevail for seven or even eight years. This phenomenon repeated for three periods of nineteen years each constitutes a marvellous coincidence such that there must be a law connecting the two phenomena."

The influence of the moon on the weather is a matter that will not be downed by the exercise of any amount of common sense. According to the most ancient notions, the moon ought to have and must have a controlling influence in excess of the sun's, and every one who seeks to demonstrate its power is liable to become infatuated with the study. The moon has so many variations north and south of the equator, north and south of the ecliptic, to and from the earth, from new moon to full moon, conspiring with the sun and opposing the sun, that it does seem as though one ought to be able to make its periodical oscillations agree with some of the many variations in the aspect of the weather. However, we know of but one relation between the moon and the earth's atmosphere that can be said to have been settled upon a rational basis and that is the matter of atmospheric tides. Laplace stated that the semidiurnal lunar tide in the atmosphere ought to amount to about 0.003 inches of barometric pressure for equatorial stations, and this agrees with the results of observations carried on at Batavia, Java. His formulæ also showed, although we believe he did not state the fact, that as the moon moves north and south of the equator monthly, there ought to be a fortnightly tide, or a general pull of the atmosphere southward for two weeks and northward for two weeks. This we believe was first demonstrated as an observable quantity by A. Poincaré, a civil engineer of Paris and a member of the Meteorological Society of France. From his articles published by that Society in 1885–1888, we learn that the average barometric pressure on parallels of latitude around the whole globe, as measured on the International Maps published by the United States Weather Bureau, give the following results: The pressure on latitude 40° minus that on latitude 10° is + 1.88 millimeters when the moon is in the extreme south and + 4.82 millimeters when the moon is in the extreme north. The normal difference is + 3.35. This indicates that when the moon is furthest north there is a slight accumulation of atmosphere in the Northern Hemisphere, amounting to an increase of 1.47 millimeter, or 0.06 inch of pressure on the parallel of 40°.

Now, all lunar phenomena go through rather rapid periodic changes. What happens in one part of a lunar month is offset by an opposite effect in the other half of that month, or what happens at the time when the sun and moon conspire is offset by an opposite effect a few months or years later when the sun and moon oppose each other. When the moon is far south and begins to go north, according to Mr. Russell, droughty conditions prevail and continue for seven or eight years. But the strange part is that the moon begins to go north from her extreme southern position every month without exception, not only just before the seven or eight year drought, but during the whole of that long period, and continues to do so during the whole of the succeeding rainy period. How can her beginning to go north be rationally supposed to be a basis for predicting droughts in one case and rains in another?

But if we lay aside all these vagaries about the moon, and recognize Mr. Russell's meteorological induction that droughty conditions do prevail for seven or eight years in Australia, followed by years of rain, and that this cycle of droughts and rains has been repeated about three times since 1840, then, we have a fair observational basis upon which to build a rational explanation. Now, this periodicity, or rather the irregular succession of good seasons and bad seasons is a fact recognized in every portion of the world. We have also enough data to show that in most cases a drought in one portion of the globe is accompanied by rains in other portions, and that the regions of excess and deficiency of rain move over the surface of the globe month by month and year and year. They do not move in courses so nearly parallel as to justify long range predictions any more than do our storm centers, but the movements are certainly governed by laws, and we can begin to generalize as a first step in the process from induction to deduction. For instance, floods in the upper Nile, due to rains in the highlands of central Africa, mean that an unusual proportion of moisture has been taken from the southeast trade wind current, and that, therefore, when that has turned northeastward over the Indian Ocean, and has become the southwest monsoon of India, it will bring droughts over the western portion of that country. A drought in New South Wales, or on the southeast side of Australia, means a deficiency in the easterly winds blowing on that coast, and especially so in the rainy season, or December, January, February, and March. But this means that the great area of high pressure over the Indian Ocean at latitude 30° south has been pushed farther west than usual, or in other words that the general circulation of the atmosphere in that region has been disturbed. Now, such a disturbance, continued over several months or even years, can hardly be produced by the rapidly changing moon; it might be due to secular changes in the quantity and quality of the solar heat, but is most of all, likely to be simply the result of accumulations of pressure, temperature, and moisture in various portions of the earth's atmosphere. Australia has about the same area as the United States, but lies on the average